

INTRODUCTION TO COUNTING

CROSSROADS ACADEMY
AMC PREPARATION

1. COUNTING PROBLEMS

- (1) If we roll two dice how many possible outcomes are there? What if we can't distinguish between the dice?
- (2) If we roll two dice how many ways are there for the sum of the dice to be 10? What is the most common sum that appears?
- (3) If we roll two dice what is the probability that the product is prime?
- (4) If we flip five pennies what is the probability that we got a prime number of heads?
- (5) How many different orders are there of 7 heads and 3 tails if we flip 10 pennies?
- (6) How many three digit numbers have only odd digits? What if the digits must be unique?
- (7) How many four digit numbers have the same hundreds and units digit?
- (8) How many different ways can six friends sit in a row if Brenda doesn't want to sit next to Carl?
- (9) How many different ways can we order one paperback and five hardcover books on a shelf if the paperback cannot go on the end?
- (10) How many ways are there to form a committee of two sixth graders and three seventh graders from a group of seven sixth graders and six seventh graders?

2. TIRANGLE COUNTING

- (1) What is the area of the 3–4–5 right triangle? What is the perimeter of the triangle?
- (2) If $\angle A = 100$ in an isosceles triangle what is $\angle B$?
- (3) If the area of a triangle is 24 and its height is 6 what is the length of its base?
- (4) If the length of the diagonal of a rectangle is $10\sqrt{2}$ what is the maximum possible area of the rectangle?
- (5) How many triangles with integer side lengths have perimeter 12? Which one has the largest area?
- (6) If the angles of a triangle form an arithmetic sequence and the smallest angle is $\frac{1}{3}$ the largest angle, what is the middle angle?
- (7) If the angles of a triangle form a geometric sequence with common ratio 4 what is the smallest angle?
- (8) What is the area of square $ABCD$ with $A = (1, -2)$ and $C = (21, 19)$.
- (9) If T is a regular polygon with n sides whose interior angles sum to 1440 what is n ?
- (10) What is the sum of the exterior angles of a regular octagon?